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ABSTRACT

A paired-associate task was given to 119 middle-class fourth and fifth graders to investigate the nature and development of mediational strategies in children's learning. Imagery and sentence mediators which linked the stimuli and responses of pictorial paired associates were either provided by an experimenter or generated by the children. While both experimenter-provided and subject-generated sentence and imagery strategies were equally facilitative at acquisition and on a retest a week later, variability was greater in the subject-generated strategy groups. The latter result suggests that individual differences related to strategy generation are greater than those related to strategy utilization in children at this age. (Author/DP)

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ABSTRACT

Imagery and sentence mediators which linked the stimuli and responses of pictorial paired associates were either provided by an experimenter or generated by fourth- and fifth-grade children. While both experimenter-provided and subject-generated sentence and imagery strategies were equally facilitative at acquisition and on a retest a week later, variability was greater in the subject-generated strategy groups. The latter result suggests that individual differences related to strategy generation are greater than those related to strategy utilization in children at this age.

PS 006643

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Consideration of the nature and development of mediational strategies in children's associative learning has been extensive in recent years (cf. Reese, 1970). Based on the research programs of Rohwer (1967), Paivio (1969), Bower (1971) and others, it has been argued (Levin, 1972) that paired-associate learning is dramatically facilitated either: (a) when the learning materials are well organized by E for S (hereafter referred to as an E-provided strategy); or (b) when S creates such organizations during learning (hereafter, an S-generated strategy). Although the basis for these arguments has been substantiated across experiments, systematic comparisons of the two strategy types have not yet been made.

Moreover, conclusions about the effectiveness of mediational strategies are generally derived from learning performance during a single session. There is some evidence to suggest that facilitative effects attributable to E-provided mnemonics may dissipate over time (Olton, 1969). In the present experiment, short- and long-term effects of E-provided and S-generated strategies were compared, since even if no immediate differences between strategy types were found, they might become evident as time passed. It was expected that strategy-type differences (if any) would favor S-generated mediators, due to their greater S involvement, uniqueness, and the like.

In addition, both verbal and imaginal mediators were employed. Previous investigators have detected only minimal differences between the two in

ps006643

initial learning, regardless of whether the strategies are E-provided (Davidson & Adams, 1970; Rohwer, Ammon, Suzuki, & Levin, 1971) or S-generated (Levin, Davidson, Wolff, & Citron, in press). The generality of these results over time was assessed in the present study.

METHOD

Design and Materials

A paired-associate learning task was adopted, with the materials to be learned consisting of twenty pairs of pictures generated by random combinations of the items. The pictures, which had been photographed onto transparencies, were line drawings of objects and animals familiar to elementary school children (e.g., a cat, a boat, a house, etc.). The paired pictures were presented to Ss according to one of the five following conditions: (i) Control, where S was shown two pictures side by side (e.g., a cat and an apple), and given no special learning strategy; (ii) S-generated sentence, where S was instructed to generate a covert sentence which described an interaction between the two adjacent pair members; (iii) S-generated imagery, where S was instructed to generate a visual image of an interaction between the two adjacent pair members; (iv) E-provided sentence, where S was actually provided with a sentence which described an interaction (e.g., "The cat bites the apple."); and (v) E-provided imagery, where S was actually provided with a picture of the objects in interaction, rather than side by side (e.g., the cat was depicted as taking a bite out of the apple). To provide comparable verbal labeling of the stimulus and response members in all conditions, the tape recorded names of the pictures were played to all Ss except those in the E-provided

sentence condition, where the sentence itself served to label the objects.

Subjects

A total of 119 middle class fourth and fifth grade children served as Ss. Ss were randomly assigned to experimental conditions in blocks of five, where each block constituted a replication of the experiment.[2] Approximately 24 Ss per condition were selected in order that differences between conditions in excess of 2/3 of a within-cell standard deviation could be detected with reasonable statistical power.

Procedure

A paired-associate study/test recognition method for individual Ss was employed. The E presented twenty pairs to each S by means of a Carousel slide projector with a rear projection screen. Each pair was exposed for four seconds. At the beginning of each experimental session, Ss were apprised of their task and then shown two examples of the type of pairs they were to learn. For each example, Ss in the S-generated sentence (or imagery) condition were asked to construct a sentence (an image) involving the two pair members. Ss were told to report their sentences (images) to E, who then gave an example of a plausible sentence (displayed a plausible interaction) that they might have generated. The Ss were then given practice in the testing procedure to be used, which is described below.

During the actual task, Ss in the S-generated conditions were not asked to report their covert sentences or images. Two study-test trials were administered. Following the first study

trial, Ss were shown only the stimulus member of the pair (the one on the left), and then given 10 seconds to point to the missing picture on a large recognition board which contained all of the response members. Test items were presented in a random order different from that used on the study trial, and following the last test item a second study/test cycle was begun (employing another two random orders). All Ss were tested for recognition of correct responses during the two test trials, as well as after an interval of one week.[3]

RESULTS

The results of the experiment are presented in Table 1, where the

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Insert Table 1 about here

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maximum possible score for each of the three test trials was 20. Analysis of the first-session data revealed a significant main effect of Conditions ($F = 16.97$, $df = 4/114$, $p < .01$) and of Trials ($F = 371.13$, $df = 1/114$, $p < .01$), as well as a significant Conditions by Trials interaction ($F = 4.01$, $df = 4/114$, $p < .01$). Within the Conditions main effect, Tukey post hoc comparisons were conducted with the probability of a Type I error (α) set equal to .05. It was found that each of the four strategy conditions differed from the control, though not from one another. (To dismiss a "ceiling effect" argument, it should be mentioned that precisely the same conclusions are reached when Trial 1 data are analyzed separately.) Post hoc Scheffé comparisons ($\alpha = .05$) within the Conditions by Trials interaction revealed that Ss in the control condition improved more from

Trial 1 to Trial 2 than did Ss in the strategy conditions, as would be expected from the high first trial performance of Ss in the latter conditions.

Although the four strategy conditions did not differ among themselves with regard to mean performance, an examination of the four Trial 1 variances was informative. Significant differences were detected (F-max = 2.85, df = 4/92, $p < .05$), with inspection of the data suggesting that the variances of the two E-provided conditions (9.87 and 12.65 for sentence and imagery respectively) were substantially less than those of the two S-generated conditions (21.68 and 28.17 respectively). An interpretation of this result will be offered in the following section.

The retest data a week later were summarized in two ways: in terms of number of correct responses, as in the initial session; and in terms of percent of Trial 2's score from the preceding week. On both measures, significant Conditions effects were detected (F = 14.06, df = 4/114, $p < .01$ and F = 7.54, df = 4/114, $p < .01$ respectively). Using Tukey's procedure and $\alpha = .05$, it was found that on both measures each strategy condition differed significantly from the control, with no differences among strategy conditions.

DISCUSSION

The finding that all strategies produced facilitation which persisted over a week's time extends the results of previous research, and offers encouragement for the durability of such strategies in school-learning situations. No differences in mean performance (either short- or long-term) resulted from requiring S to generate his own verbal or imaginal learning

PS 006643

strategy, as opposed to using one that was already provided for him. It had been expected that differences in favor of S-generated mediators might be detected as a result of their potentially greater meaningfulness to S as he generated them.

Although this expectation was not confirmed across all Ss, an interesting datum provides partial support. Specifically, performance in the S-generated conditions was found to be considerably more variable than that in the E-provided conditions. The nature of the variability difference (as determined by a plot of the data) was such that a greater proportion of very high, as well as very low, scores was evidenced in the S-generated conditions. One tempting conclusion is that not all Ss at this age are facile at executing learning strategies on request, but those who are will benefit more than will Ss who simply employ a strategy provided by someone else. At the same time, it is reasonable to expect many of the seemingly nonmediator-generating Ss to profit from other kinds of strategy inducement (e.g., Danner and Taylor, 1972; Varley, Levin, Severson, and Wolff, 1973; Wolff and Levin, 1972)--or even, perhaps, more simply from a study interval longer than four seconds.

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FOOTNOTES

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[2] This kind of random assignment procedure should not be considered foolproof, however, since inadvertently slightly different numbers of Ss ended up in the five conditions, viz., 23, 24, 23, 25, and 24 in the order of conditions listed previously.

[3] In assessing long-term effects, the authors decided against either employing independent groups or equating Ss with regard to original learning (cf. Underwood, 1954) since retention per se was not of interest. Rather, the chosen procedures more closely resembled the learn/test/retest format of the schools, to which generalizations were sought.

Table 1. Mean Performance on the Learning Task during the Initial Session and One Week Later

		Condition				
		Control	S-generated Sentence	S-generated Imagery	E-provided Sentence	E-provided Imagery
Initial Session	Trial 1	5.70	12.12	13.09	14.96	12.71
	Trial 2	12.87	16.96	17.35	19.24	17.75
One Week Later	Retest	6.91	13.17	13.13	14.84	14.12
	Percent of Trial 2	53	77	74	77	80